



BISHOP PAIUTE TRIBE
Environmental Management Office

**AIR QUALITY ON THE BISHOP PAIUTE RESERVATION
SOURCE AND EMISSIONS INVENTORY**

Prepared for
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EXECUTIVE SUMMARY

The Bishop Paiute Reservation is located in the Owens Valley in eastern California, near the Nevada border. The reservation itself comprises 875 contiguous acres and is flanked by the City of Bishop to the East. It is surrounded by private lands and by lands owned by the Los Angeles Department of Water and Power. Approximately 1,350 people live on the Reservation.

The Bishop Paiute Reservation is located within Great Basin Unified Air Pollution Control District (GBUAPCD), which includes all of Inyo, Mono, and Alpine Counties. These are all rural counties with few large stationary sources of air pollution. The air quality in the District is generally good, although there are several important exceptions. The principal source of concern is PM-10, particulate matter that is less than 10 microns in diameter (smaller than a human hair). In the Owens Valley, the principal PM-10 pollutant is windblown dust. PM-10 is a concern because the particles can settle in the human lung and may cause respiratory problems.

The most significant regional source of pollution is the Owens Dry Lake, located just 60 miles South of the Bishop Reservation. This dry lakebed is the largest source of PM-10 in the nation, violating federal air standards by a factor of 75 in 2001. The dry lakebed is the single most important source of regional air pollution affecting the Bishop Paiute Reservation. Covering 110 square miles, the Owens Dry Lake yields between 130,000 to 400,000 tons of PM-10 per year. Dust storms from the Owens Lake can obscure visibility up to 150 miles away.

There is currently no air quality monitoring in the immediate vicinity of the Bishop Paiute Reservation. The most recent data are for the city of Bishop and date back to the mid-1990s. In nearby Bishop, PM-10 is the most important pollutant measured. For the immediate Bishop vicinity, the chemical composition of PM-10 is unknown because there have been no speciation analyses completed to date. Analyses of PM-10 data for the period 1987-1997 point toward wood smoke from residential heating as a possible candidate source of PM-10 emissions due to the seasonal pattern of higher concentrations in the winter. Although there were no violations of the federal standard ($\text{PM-10} > 150 \mu\text{g} / \text{m}^3$) during this period, in the coldest months of December and January, over 30 percent of PM-10 readings were in excess of the state standard ($\text{PM-10} > 50 \mu\text{g} / \text{m}^3$). This means that on average Bishop violates the state PM-10 standard about 10 days per month in December and January and a total of nearly 30 days per year. Because monitoring data for PM-10 were collected only 1 day out of 6, important episodes of poor air quality may have been missed. Ozone and carbon monoxide, monitored from 1991 to 1995 revealed no violations of state or federal standards.

This source and emissions inventory identified the following sources within the Bishop Paiute Reservation, listed from highest to lowest priority.

- a. Emissions from residential trash burning (highest priority for regulation in concert with solid waste plan)
- b. Smoke from residential wood burning for home heating (next highest priority)
- c. Emissions from vegetative waste (low priority due to the small quantities involved)
- d. Fugitive dust from dirt roads (low priority due to small number of miles involved)

- e. Fugitive dust from paved roads (low priority due to small number of miles involved)
- f. Vehicle emissions (low priority due to small population size)

PM-10 data from on-reservation sources are given below. The largest source of PM-10 is from residential wood burning for home heating. Fugitive dust from dirt roads is next. Among the sources of air pollution on the reservation, residential trash burning has been identified as the highest priority source for reducing on-reservation emissions. Trash burning is also a source of dioxins, a toxic air contaminant and has recently been regulated by the California Air Resources Board. The Bishop Tribe's Environmental Management Office proposes to develop a plan for reducing residential trash burning in conjunction with a solid waste management plan. Residential wood burning for home heating is the next highest priority source for reducing on-reservation emissions because it is the largest source of PM-10 on the reservation.

Table E1. PM-10 from On-Reservation Sources

SOURCE	PM-10 (Kg/year)	PM-10 (tons/year)
Residential Trash Burning	1,562	1.72
Smoke from Residential Wood Burning for Home Heating	14,306	15.77
Vegetative Waste	127	0.14
Fugitive Dust from Dirt Roads	4,745	5.23
Entrained Paved Road Dust	3,584	3.95
Other Vehicle PM-10	322	0.35

CONCLUSIONS AND POLICY RECOMMENDATIONS

Due to the lack of any air quality monitoring in the Bishop area and proximity to the Owens Valley dry lake, the Environmental Management Office believes that initiating air quality monitoring for particulate matter (PM-10 and PM-2.5) is the highest priority for the Air Quality Program. Ideally monitoring will include both PM-10 and fine particulates (less than 2.5 microns in diameter) because fine particulates may be an even more important source of concern for health. Monitoring should be undertaken concurrently with the development of a solid waste management plan, to minimize residential trash burning, a source of PM-10, PM-2.5 and dioxin.

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ACKNOWLEDGEMENTS

We would like to express our appreciation to a number of people who provided assistance with this report. The staff of the Great Basin Air Pollution Control District helped with a number of aspect. Duane Ono carefully reviewed drafts and provided detailed comments and helpful suggestions. Jim Parker supplied data for the Bishop area and answered countless questions regarding the information. Chris Lanane answered numerous questions about monitors. We also want to thank John Sagebeil from the Desert Research Institute of the University of Nevada at Reno who reviewed the wood smoke calculations. Finally, we want to express our special thanks to Doug McDaniel from US EPA Region 9 Air Division for his careful review of the draft and helpful comments.

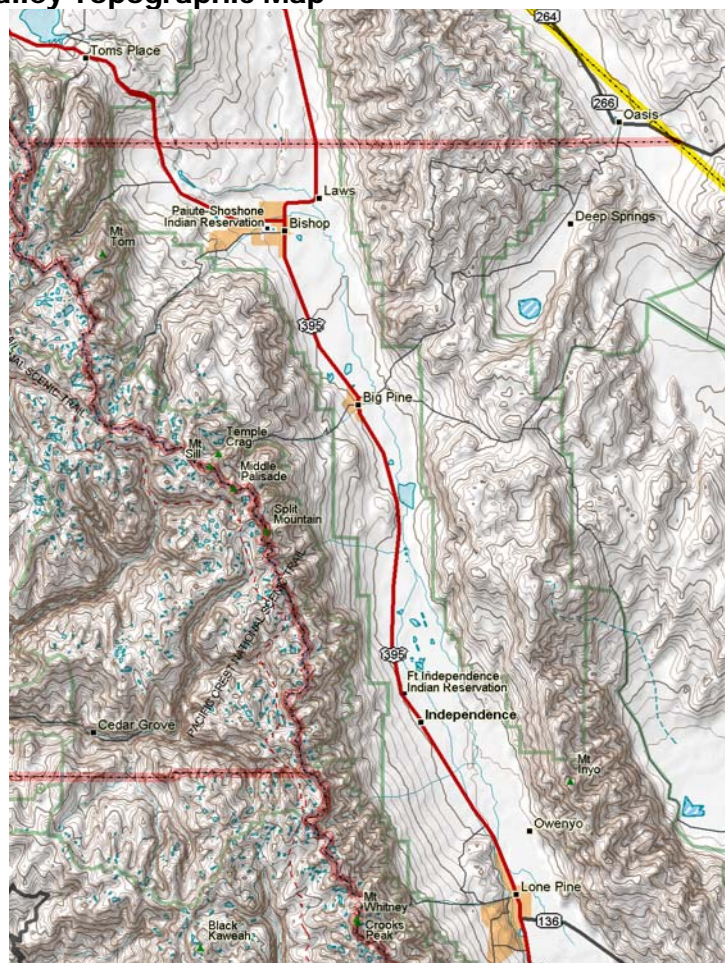
AIR QUALITY ON THE BISHOP PAIUTE RESERVATION SOURCE AND EMISSIONS INVENTORY

1. BACKGROUND, LOCATION AND HISTORY

a. Location of Bishop Reservation

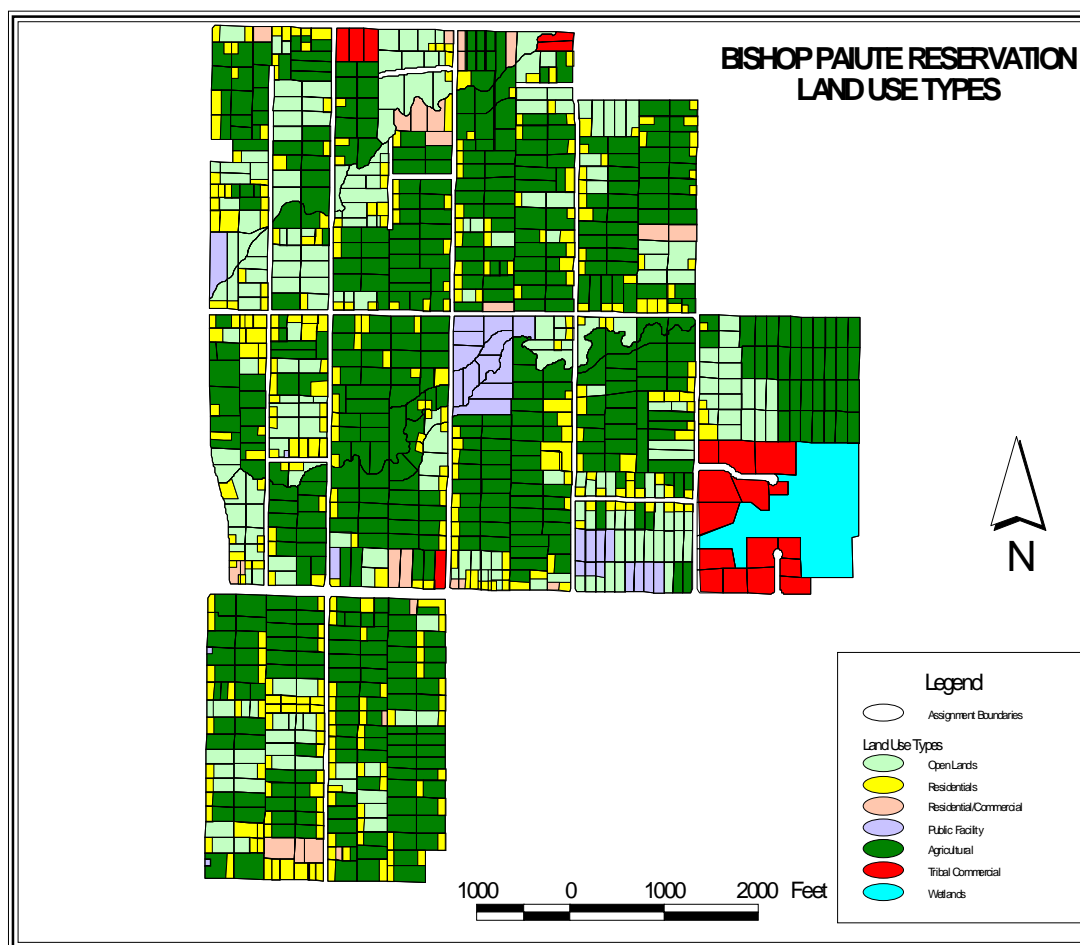
The Bishop Paiute Reservation is located in the Owens Valley in eastern California, near the Nevada border. The area is sometimes known as “the deepest valley” it is flanked by two 14,000-foot ranges – the Sierra Nevada to the west and the White Mountains to the east. The region includes some of the most spectacular scenery in the United States. Both mountain ranges are comprised of National Forest and Park lands that include substantial wilderness areas and multiple Class I air-sheds (areas designated under the Federal Clean Air Act for Protection from Significant Deterioration). From time immemorial, the Paiute People have been shepherds of the Valley from crest to crest. The Bishop Paiute Tribe continues to maintain that interest by helping protect the air quality in this magnificent landscape. Map 1 depicts the Owens Valley.

Map 1. Owens Valley Topographic Map



Map 2 shows the Bishop Paiute Reservation land uses. Nearly all of the land on the Reservation is assigned to individual families, with a limited number of acres set aside for public and commercial facilities. Despite substantial population growth since the creation of the Reservation in 1939, many of the assigned lands are in agriculture (pasture or alfalfa, primarily) or are open lands.

Map 2. Bishop Paiute Reservation Land Use



The reservation itself comprises 875 contiguous acres and is flanked by the City of Bishop to the east. It is surrounded by private lands and by lands owned by the Los Angeles Department of Water and Power. Approximately 1,350 people live on the Reservation.

b. Meteorology

The Owens Valley is at the western edge of the Great Basin. The climate is high desert. Summary weather information from the Bishop Airport is provided in Table 1, below. The weather is moderate, with an annual average high of 74 degrees and an annual average low of 39 degrees. Due to the desert climate, daily temperatures can vary by 40 to 50 degrees. The record high is 112 degrees F and the record low is -8 degrees F. Precipitation is low, with an annual average rainfall of 5.4 inches.

Table 1. Meteorological Data for Bishop Airport Weather Station, 1948-2001

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Overall
Temperature													
Average High (deg. F)	53	58	63	71	80	90	97	94	86	76	62	53	74
Average Low (deg. F)	22	26	30	35	43	51	56	54	46	37	27	21	39
Mean (deg. F)	38	42	47	53	62	71	77	75	67	57	45	38	58
Record High (deg. F.)	76	81	87	93	101	109	109	107	112	97	84	78	112
Year	1998	1986	1966	1989	1951	1954	1972	1993	1995	1980	1988	1958	
Record Low (deg. F)	-7	-2	9	15	25	29	34	37	26	16	5	-8	-8
Year	1974	1969	1971	1953	1964	1988	1987	1959	1948	1970	1958	1990	
Precipitation													
Average (Inches)	1.1	1.0	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.6	0.8	5.4

Source: National Climatological Data Center as reported on www.weather.com, 7/15/2002.

c. Measuring air quality

Air pollution is of concern because of its impacts on human health. Two aspects of air quality are typically measured. The first concerns five criteria pollutants: particulate matter (PM), carbon monoxide (CO), ozone (O₃), sulfur dioxide (SO₂) and nitrogen dioxide (NO₂). Federal and state standards have been established for each of these five pollutants. These standards are based on the health impacts of each pollutant. Federal standards apply to all lands, including Indian reservations. In addition states may establish their own standards, but state standards do not apply to Indian reservations. California state standards are typically more stringent than the federal standard. In this report, both the state and the federal standard are referenced. These standards are used to classify areas as attainment or non-attainment for each of the criteria pollutants. The second aspect of air quality concerns air toxics, compounds that have known or suspected health impacts. No level of these contaminants is considered safe. The US EPA currently lists 188 compounds as air toxics. Dioxin is one of these compounds and is examined in more detail in this report.

d. Regional air quality

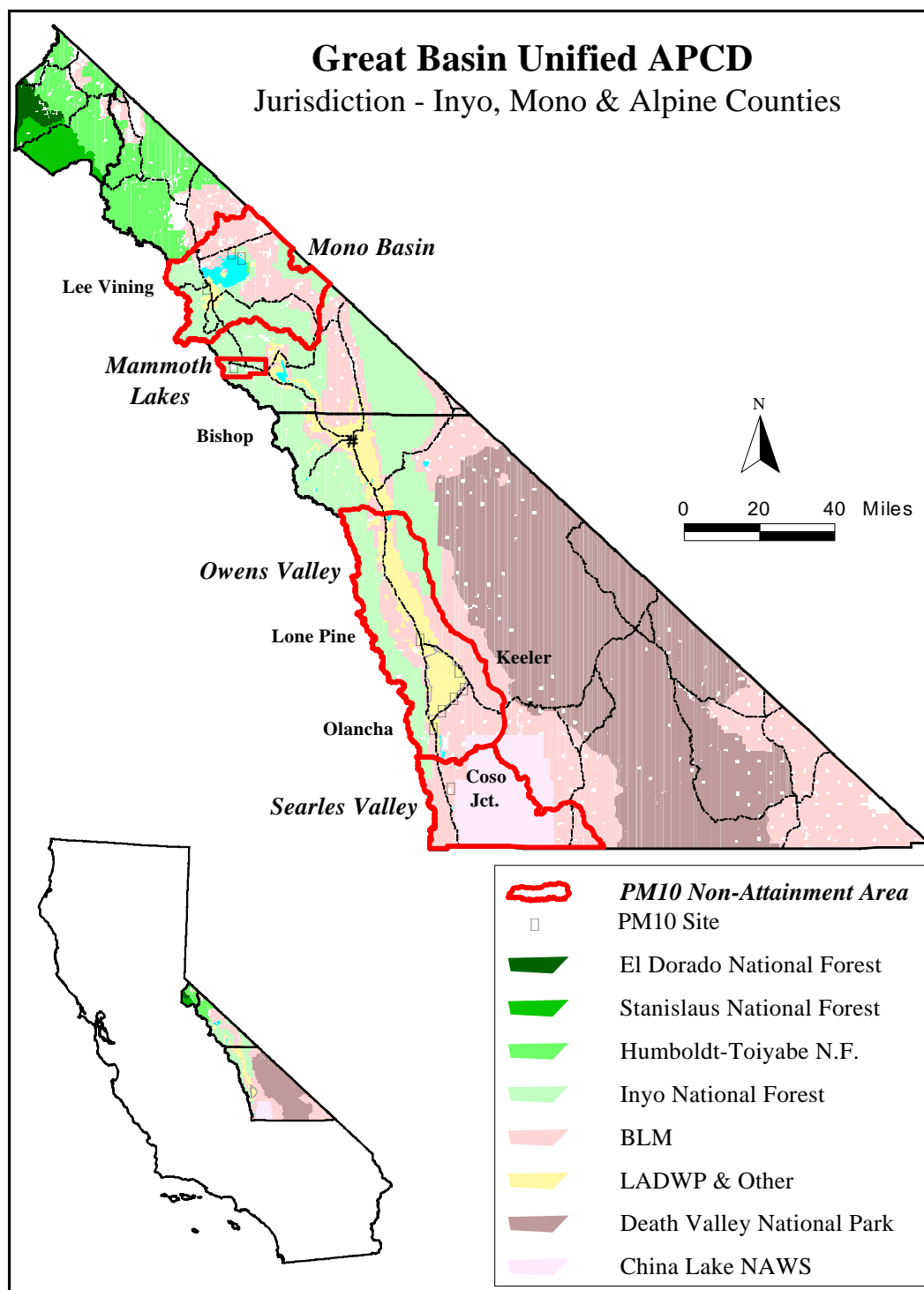
The Bishop Paiute Reservation is located within Great Basin Unified Air Pollution Control District (GBUAPCD), which includes all of Inyo, Mono, and Alpine Counties. (See Map 3, below.) These are all rural counties with few large stationary sources of air pollution. The air quality in the District is generally good, although there are several important exceptions. The principal source of concern is PM-10, particulate matter that is less than 10 microns in diameter (smaller than a human hair). In the Owens Valley, the principal PM-10 pollutant is windblown dust. PM-10 is a concern because the particles can settle in the human lung and may cause respiratory problems. The elderly, children and those with other respiratory problems are most susceptible.

Within the GBUAPCD, there are four areas where PM-10 levels violate state and federal standards. The Town of Mammoth Lakes, located in a mountain basin at 8,000 feet approximately 45 miles North of Bishop has historically had PM-10 violations due to wood

smoke and entrained dust from cinders used for snow and ice. Farther north, Mono Lake also has a history of PM-10 violations due to fugitive dust from the lakebed that has been exposed by stream diversions implemented by the Los Angeles Department of Water and Power. However, the most significant source of pollution within the GBUAPCD is the Owens Dry Lake, located just 60 miles South of the Bishop Reservation. This dry lakebed is the largest source of PM-10 in the nation and is described separately in this report. Finally, at the south of Inyo County, the Coso Junction area has high levels of PM-10 due to the Owens Dry Lake as well.

e. Ongoing monitoring by Great Basin Unified Air Pollution Control District

The Great Basin Unified Air Pollution Control District includes all of Alpine, Mono and Inyo Counties. The Bishop Paiute Reservation is located near the town of Bishop in the northern portion of Inyo County, approximately in the center of the District. There are four PM-10 non-attainment areas in the District, described from North to South. The GBUAPCD operates monitors for PM-10 in each of these non-attainment areas as shown in Map 3 below.

Map 3. Great Basin Unified Air Pollution Control District

The northern-most non-attainment area is Mono Lake, a source of dust storms caused by draw down of the lake to supply the city of Los Angeles, nearly 300 miles away. The town of Mammoth Lakes is also a non-attainment area, due primarily to wood smoke and entrained cinders from roads (GBUAPCD, 1990, Air Quality Management Plan for the Town of Mammoth Lakes). The largest non-attainment areas are in Southern Inyo County where there are two

contiguous areas, one encompassing the Owens Dry Lake and one in the Coso Junction area, and adjacent to nearby Kern County. Both non-attainment areas are attributed to the Owens Dry Lake created by water diversions to supply the city of Los Angeles. It is the largest source of PM-10 in the United States. Issues related to the dry lake are discussed separately in Section 3.

The GBUAPCD reports air quality information to US EPA through the AIRS database. The most recent data that exceed federal standards are shown in Table 2 below. The high values for ozone are from the Death Valley area where ozone is transported from the San Joaquin Valley of California (CARB, 2001 Almanac of Emissions), a severe ozone non-attainment area. The extraordinarily high values of PM-10 (over 75 times the 24-hour standard) are from the Owens Dry Lake, described separately in Section 3. PM-10 and ozone data for Bishop obtained from the GBUAPCD are analyzed separately below in Section 2.

Table 2. Inyo County Summary Data for Exceedances of Federal Standards

Year	Ozone (PPM) 2 nd Max 24-hr	PM-10 ($\mu\text{g}/\text{m}^3$) 2 nd Max 24-hr	PM-10 ($\mu\text{g}/\text{m}^3$) Annual Mean
2001	0.092	12,160	267.7

Source: US EPA AIRData, Monitor Summary Report, 2001.

The GBUAPCD also reports to the California Air Resources Board. Summary Estimated Annual Average Emissions for 2001 for Inyo County are displayed in Table 3 below. The most important sources of airborne pollutants in Inyo County are motor vehicles and fugitive dust from the Owens Dry Lake. Emissions from motor vehicles and on the Dry Lake are addressed in detail in Sections 5 and 3, respectively.

Table 3. Inyo County 2001 Estimated Annual Emissions in Tons per Day

Category Name	TOG	ROG	CO	NOX	SOX	PM	PM-10
Fuel Combustion	0.01	0.01	0.03	0.69	0.56	0.08	0.06
Waste Disposal				0.00		0.00	0.00
Cleaning and Surface Coatings	0.24	0.20					
Petroleum Production and Marketing	0.06	0.06					
Industrial Processes			0.00	0.03	0.03	1.29	0.59
Subtotal Stationary Sources	0.30	0.26	0.04	0.71	0.59	1.37	0.65
Solvent Evaporation	1.41	1.38					
Miscellaneous Processes*	0.75	0.33	4.53	0.10	0.01	1,642.69	825.79
Subtotal Area-Wide Sources	2.16	1.71	4.53	0.10	0.01	1,642.69	825.79
On-Road Motor Vehicles	2.02	1.88	16.52	1.96	0.01	0.04	0.04
Other Mobile Sources	0.48	0.45	2.40	0.54	0.06	0.04	0.04
Subtotal Mobile Sources	2.50	2.33	18.91	2.50	0.07	0.08	0.08
Subtotal Natural Sources**	0.12	0.07	1.90	0.09		0.39	0.37
TOTAL	5.08	4.37	25.38	3.40	0.67	1,644.63	826.90

NOTES: * Primary source of area-wide air pollution is fugitive windblown dust (mainly from the Owens Dry Lake).

** Primary natural source of air pollution is wildfires.

DEFINITIONS: TOG: total organic gasses; ROG: reactive organic gasses; CO: carbon monoxide; NOX: nitrogen oxides; SOX: sulfur oxides; PM: particulate matter; PM-10: particulate matter less than 10 microns in diameter

SOURCE: California Air Resources Board website, www.arb.ca.gov 4/17/02.

Table 4 below compares the Great Basin Valleys Air Basin (Inyo, Mono and Alpine counties) to the Mojave Desert (San Bernadino County, eastern portions of Kern, Los Angeles and Riverside counties) and San Joaquin (SanJoaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare counties and western portion of Kern County) Air Basins and to statewide numbers. The primary distinguishing feature of the Great Basin Unified Air Pollution Control District as compared to the state and other nearby air basins is the extremely high level of PM and PM-10 emitted from the Owens Dry Lake. All other pollutants are at comparatively low levels, testifying to the generally good air quality in the region.

Table 4. Comparison of Air Basins and State of California in Tons per Day

Air Basin / Region	TOG	ROG	CO	NOX	SOX	PM	PM-10
Great Basin Valleys	14.99	12.55	70.03	6.03	0.86	1,704.29	862.22
Mojave Desert	208.26	85.87	471.46	226.21	15.07	295.97	170.17
San Joaquin Valley	1,609.18	473.71	2,227.02	548.71	45.68	863.78	473.54
State of California	6,521.52	3,046.31	1,7474.05	3,441.21	302.34	4,210.01*	2,418.39*

NOTES: * Excludes the Owens Dry Lake and Mono Lake, estimated at 1,600 tons PM per day and 800 tons PM-10 per day).

DEFINITIONS: TOG: total organic gasses; ROG: reactive organic gasses; CO: carbon monoxide; NOX: nitrogen oxides; SOX: sulfur oxides; PM: particulate matter; PM-10: particulate matter less than 10 microns in diameter

SOURCE: California Air Resources Board website, www.arb.ca.gov 5/17/02.

2. ANALYSES OF EXISTING AIR QUALITY DATA FROM NEIGHBORING JURISDICTIONS

a. PM-10 data for Bishop

PM-10 refers to particles that are less than 10 microns in diameter, smaller than a human hair. These small airborne particles are of concern because they can settle in the lung if inhaled and have the potential to cause a variety of respiratory problems. PM-10 is a criterion pollutant. The federal standard is a 24-hour concentration of $150 \mu\text{g}/\text{m}^3$. The state standard is $50 \mu\text{g}/\text{m}^3$.

PM-10 data for the nearby city of Bishop were obtained from the GBUAPCD. These data were collected once every 6 days using a size-selective inlet sampler for the period 1987-1997. Data collection was discontinued in 1997 due to the lack of any violations of the federal air quality standard during this 10-year period and the demolition of the monitor station. No speciation information is available to describe the chemical composition of these samples.

Analyses of these data were carried out to obtain a better understanding of air quality in the Bishop area. Special attention was paid to values in excess of the California 24-hour standard of $50 \mu\text{g}/\text{m}^3$ and to developing an understanding of seasonal patterns. (There were no values in excess of the federal standard of $150 \mu\text{g}/\text{m}^3$.)

The data set contains 446 observations, over a 10-year period, with some missing information in 1992 when the location of the observation station changed. In general the air quality in the Bishop area is good, as indicated by low values of PM-10. The highest observed value is 100, in December 1990 and the lowest value is 5, observed in April 1995. The most common values are in the range of 10 to 19 and 19 to 29, accounting for 73 percent of observed values. See Table 5 below.

Table 5. Percent Distribution of 24-Hour PM-10 Values, Bishop 1987-1997

PM-10	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 and over
Percent	3%	40%	33%	12%	4%	4%	3%	2%

NOTE: Federal Standard is $150 \mu\text{g} / \text{m}^3$ and state standard is $50 \mu\text{g} / \text{m}^3$.

SOURCE: Great Basin Air Pollution Control District, data archives.

Seasonal patterns were examined to evaluate the potential contribution of wood burning for residential heating during the winter months. High values during the winter months would point to residential wood burning for home heating as a possible emission source. The presence of visible wood smoke in and around the Reservation during the winter months also indicates residential wood burning as a possible emission source. (This was investigated more fully through a survey of Reservation residents.)

Table 6 below shows the frequency distribution of PM-10 values from data covering the period 1987-1997, tabulated by month and in intervals of 10 points (except for the first and last interval. A clear seasonal pattern is apparent. Nearly all values equal to or in excess of the state standard of $50 \mu\text{g} / \text{m}^3$ fall in the months of November through January, with the majority falling in December and January which are characteristically some of the coldest months in the area. Estimates of PM-10 emissions from residential wood burning are given in Section 5.

Table 6. Frequency Distribution of 24-Hour PM-10 Values 1987-1997.

PM-10 Values	Month												
Range	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
0 to 19	5	12	25	27	22	22	11	20	20	13	8	7	192
20 to 29	11	15	10	12	11	12	22	12	12	18	5	9	149
30 to 39	5	6	3	2	2	1	1	6	2	4	12	8	52
40 to 49	6	5	1		1			1			1	3	18
50 to 59	5	1	1			1				1	3	4	16
60 to 69	5										1	6	12
70 and over	3										1	3	7
Total	40	39	40	41	36	36	34	39	34	36	31	40	446

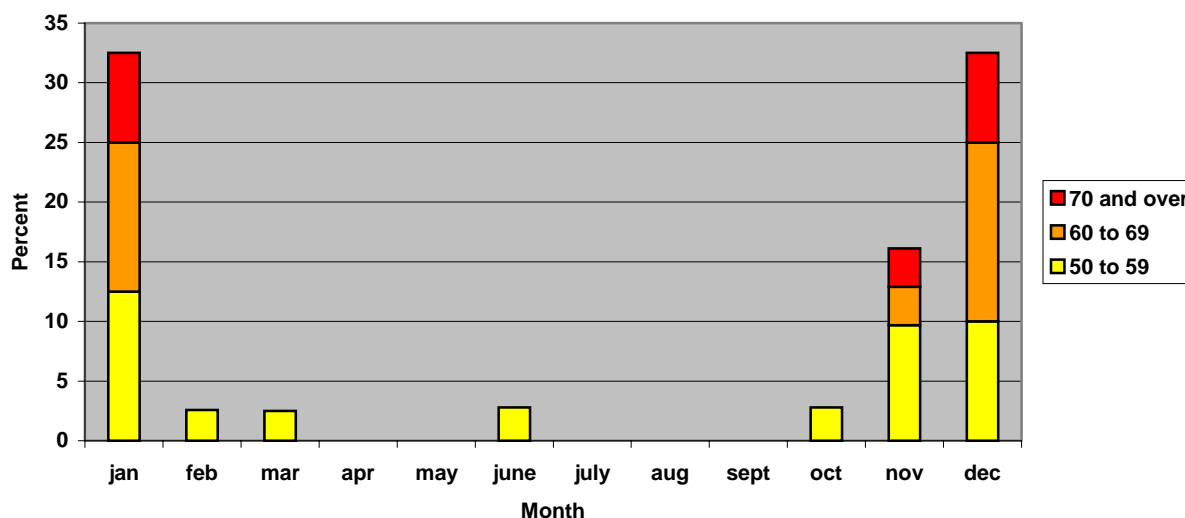
NOTE: Federal Standard is $150 \mu\text{g} / \text{m}^3$ and state standard is $50 \mu\text{g} / \text{m}^3$.

SOURCE: Great Basin Air Pollution Control District, data archives.

The same information is shown graphically in Figure 1 below. Note that in the coldest months of December and January, over 30 percent of PM-10 readings were in excess of the state standard. This means that on average Bishop violates the State PM-10 standard about 10 days per month in December and January and a total of nearly 30 days per year.

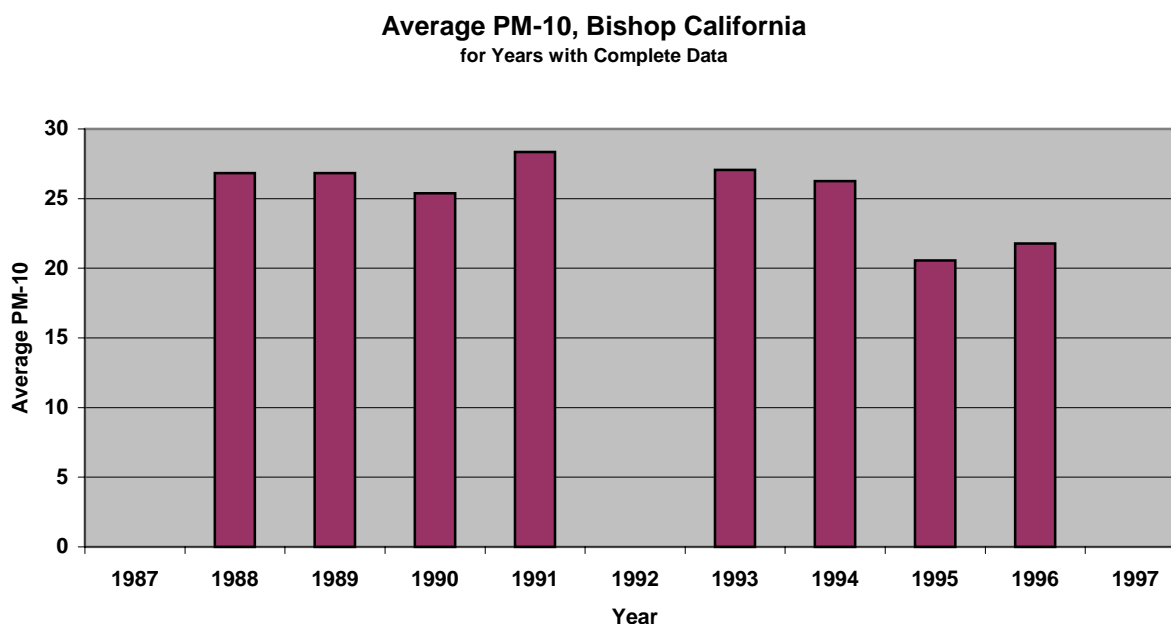
Figure 1.**Percent of Measurement Days Over California Standard for PM-10 (> 50)**

Bishop, California -- 1987-1997



SOURCE: Great Basin Air Pollution Control District, data archives.

Average values of PM-10 for each year were also examined to determine whether there was any important increase in PM-10 over the observation period. No systematic increase is observed. Only years with complete data were retained in Figure 2 below. If anything, there is a modest decrease in average values. This is most likely not due to the change in monitoring locations in 1993, as the decrease is not apparent until 1995 and 1996.

Figure 2.

SOURCE: Great Basin Air Pollution Control District, data archives.

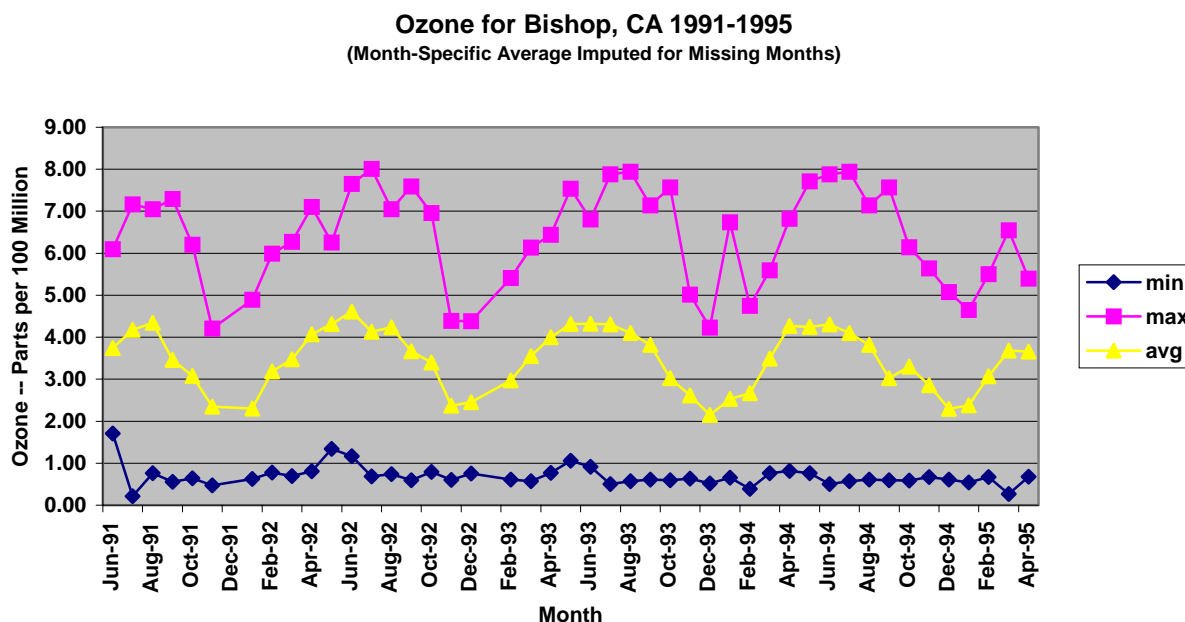
b. Ozone data for Bishop

Ozone levels are a concern for the Owens Valley in general due to transport across the Sierra Nevada from the Central Valley. Ozone is a respiratory irritant. Ozone is a criterion pollutant. The federal standard is a 1-hour concentration of 0.12 ppm. The state standard is 0.09 ppm.

The highest levels are generally found in the vicinity of Mammoth Lakes, where air is funneled from the Central Valley over Mammoth Pass. Mono County is a non-attainment area according to the state standard.

Ozone data for the nearby city of Bishop were obtained from the GBUAPCD. These data were collected hourly for the period 1991-1995. Data collection was discontinued in 1995 due to the lack of any violations of the federal air quality standard during this 4-year period (12 parts per 100 million). In addition there were no violations of the state of California standard (9 parts per 100 million), although values sometimes approached the California standard. The data set contains 33,282 observations with some missing data. The maximum value of 8.010 occurred on June 3, 1992 and the minimum value of 0.217 occurred on June 19, 1991.

Figure 3 shows the seasonal pattern over the 4 years of observation. Values for months with fewer than 100 observations were replaced by the mean for that month. (The months affected are February, March and April 1993, November 1993 and June, July, August, and September 1994). Ozone is formed during the summer months. Typically the highest values are found during the summer months, typically May through August. The lowest values are found during the winter months, typically November through January.

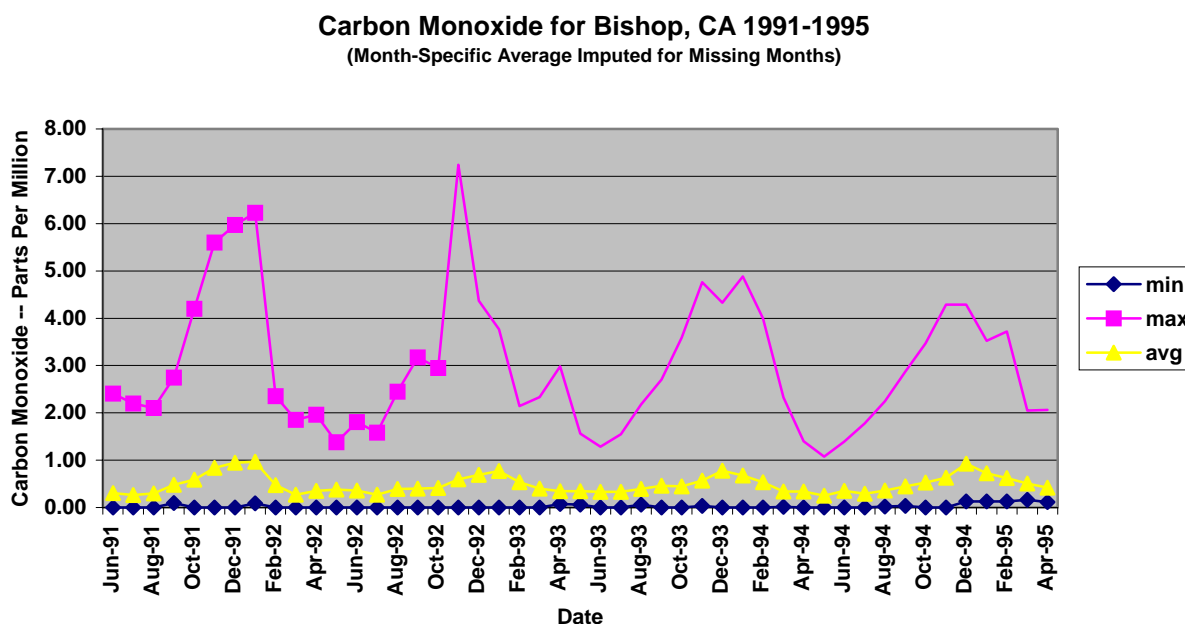
Figure 3.

NOTE: Federal standard is 12 parts per 100 million and state standard is 9 parts per 100 million.
SOURCE: Great Basin Air Pollution Control District, data archives.

c. CO data for Bishop

Carbon monoxide (CO), a product of combustion, is not a concern in the Owens Valley due to low population densities and generally good air circulation. CO is a criterion pollutant. The federal standard is a 1-hour concentration of 35 ppm. The state standard is 20 ppm.

CO data for the nearby city of Bishop were obtained from the GBUAPCD. Like the ozone data just examined, these data were collected hourly for the period 1991-1995. Data collection was discontinued in 1995 due in part to the consistently low levels observed. The state standard is 20 parts per million for 1 hour and the federal standard is 35 parts per million. The data set contains 33,410 observations with some missing data. The highest valued observed during this period is 7.24 observed on November 12, 1992, well below both the state and the federal standards. Carbon monoxide is formed in winter as a product of combustion. This data is displayed graphically in Figure 4, below.

Figure 4.

NOTE: Federal standard is 35 parts per million and state standard is 20 ppm.
SOURCE: Great Basin Air Pollution Control District, data archives.

d. Other air quality monitoring efforts

The Inyo National Forest has monitored air quality by examining lichen plots as bio-indicators of air quality. Twenty-nine plots are monitored throughout the Inyo National Forest, every five years. The 1996 report shows that 15 out of 29 plots had some sort of decline in their lichen population that cannot be attributed to other causes. In two plots, located in Bishop Creek, just above the Bishop Paiute Reservation, changes in the lichen *Xanthoia elegans* were examined. These lichen were found to be browning or bleached. Some had missing thalus centers. The reasons for these changes are at present undetermined (Inyo National Forest, Lichen Monitoring Briefing, December 1996). One hypothesis is ozone transport from the San Joaquin Valley, which has one of the most severe ozone problems in the state.

3. IMPACTS OF NEIGHBORING SOURCES ON TRIBAL AIR QUALITY

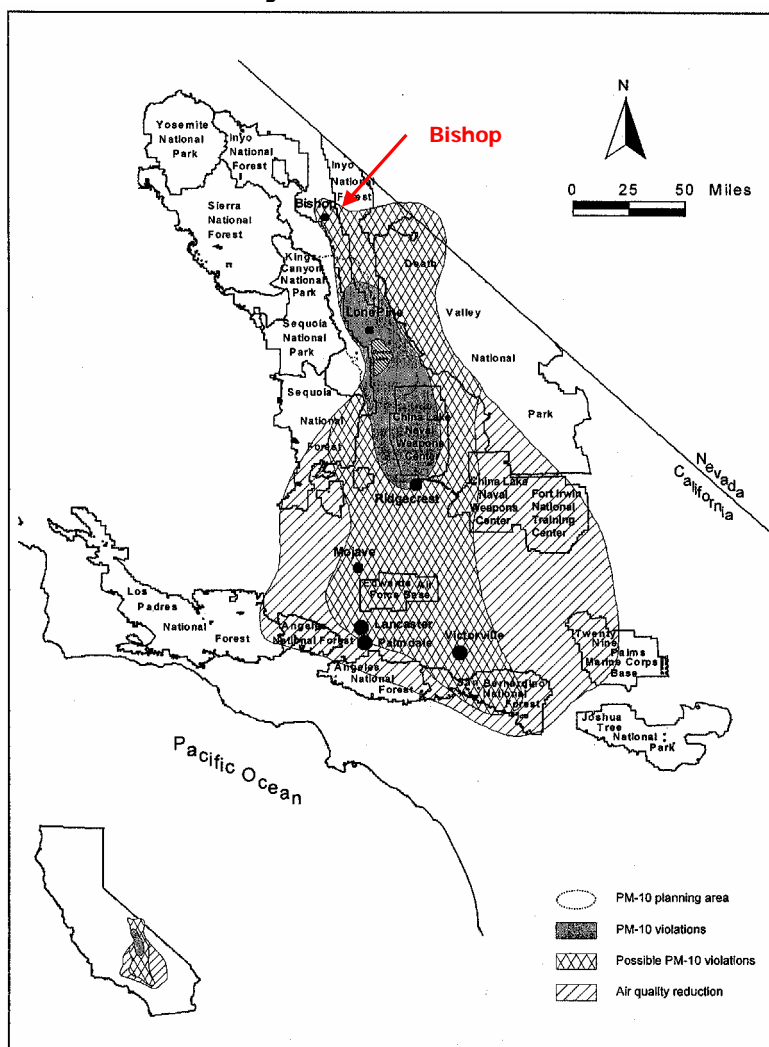
a. Owens Dry Lake

The PM-10 problem from the Owens Dry Lake was created in 1928 when the Owens Lake was emptied of water and the dry lake bed was exposed. The water diversions by the City of Los Angeles Department of Water and Power are used to this day to supply the still growing City of Los Angeles, located nearly 250 miles away. Covering 110 square miles (70,000 acres), the Owens Dry Lake is the largest man-made source of PM-10 pollution in the United States, yielding between 130,000 to 400,000 tons of PM-10 per year (Great Basin Unified Air Pollution Control District, State Implementation Plan (SIP), 1998). Dry Lake emissions were responsible for maximum PM-10 concentrations in Inyo County in excess of 10,000 $\mu\text{g}/\text{m}^3$ in 2001 (over 75

times the federal standard) (US EPA AIRS Data for 2001, www.epa.gov/airs). Dust storms from the Owens Lake can obscure visibility up to 150 miles away (GBUAPCD, SIP, 1998).

Emissions from the dry lake led the US EPA to classify the Southern Owens Valley as a "serious non-attainment area" in 1993 and resulted in the preparation of a State Implementation Plan by the Great Basin Unified Air Pollution Control District to control these emissions and meet clean air standards by 2006. Mitigation measures were initiated in January 2002. At present shallow flooding is being applied to 10 square miles of the dry lakebed.

The dry lake is located approximately 60 miles South of the Bishop Reservation and is an important concern for reservation residents because strong winds from the South have the potential to drive airborne lake dust into the Bishop area. Map 4 below shows the projected area affected by dust from the Owens Lake. The Bishop area is listed as "possible PM-10 violations," although none occurred in Bishop during 1987-1997 when the GBUAPCD was monitoring air quality in this area. However, it is important to note that this monitoring followed a sampling protocol of 1 day in 6 so that important short-term events could have been missed. In addition, the boundary for PM-10 violations is only 30 miles South of Bishop. Continuous monitoring in the Bishop area would allow ongoing comparisons of air quality in Bishop with dust storms over the Dry Lake and make it possible to directly examine the impact of these dust storms on the Bishop area.

Map 4. Projected Area Affected by Dust from Owens Lake

Source: GBUAPCD, SIP, 1998

b. Pine Creek Tungsten Mine

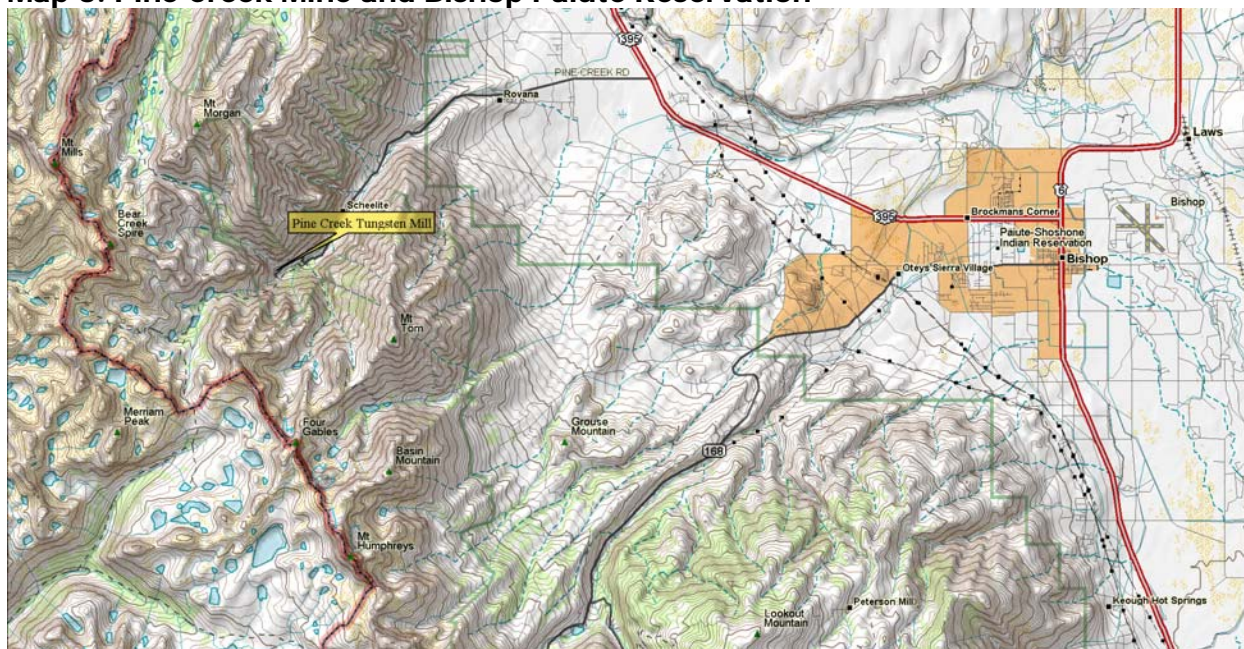
The Pine Creek Tungsten Mine is located approximately 10 miles from the Bishop Reservation. When it was in operation, it was one of the largest tungsten mines in the United States, with tunnels extending over a mile into the Sierra Nevada. This mine is now closed because tungsten mining is no longer profitable. The mine is located on the Inyo National Forest, at an elevation of approximately 7,000 feet.

In 1989, the White Mountain Ranger District of the Inyo National Forest developed a closure plan (amended in 2001). This closure plan addresses primarily water quality issues arising from water flowing through the former tailing piles into nearby Pine Creek. However, these tailing piles have an associated set of ponds which are now dry. The ponds cover over 80 acres. Their surface is covered with a fine silica dust that may be an important source of pollution that could impact the Bishop area if the closure measures are not successful (personal conversation with Lucy McKee, former District Ranger). Prior to the initiation of the closure activities, dust was visible in Pine Creek Canyon when winds came from the west or southwest down the

canyon. (Personal observation.) The closure measures involve covering the tailing ponds and piles with clean fill from a borrow pit below the mine and re-vegetation with native plants. Closure activities were initiated in the spring of 2001. Now that the ponds are covered with a gravelly/sandy fill to a minimum depth of 18 inches, fugitive dust is no longer expected to be a problem (personal conversation with Vernon McLean, Inyo National Forest).

The Great Basin Unified Air Pollution Control District expects the closure measures to be successful and does not currently have any monitoring activities in the vicinity of the Pine Creek Mine, although a weather station is located just below the mine and can provide information on winds and dispersion of materials. Additional monitoring may be valuable to ensure that the closure is successful and that the tailings ponds are not an ongoing source of fugitive dust. Map 5 below shows the location of the Pine Creek Mine relative to the Bishop Paiute Reservation.

Map 5. Pine Creek Mine and Bishop Paiute Reservation



c. Permit data from Great Basin Unified Air Pollution Control District

The Great Basin Unified Air Pollution Control District has supplied information for all permits in the Bishop vicinity. For the most part, these industrial sites are small and are located in such a manner that pollutants are not routinely carried onto the Bishop Paiute Reservation (personal communication, Duane Ono, GBUAPCD). Data from all sites for 1999 is shown in Table 7 and the location of each site is shown on Map 6.

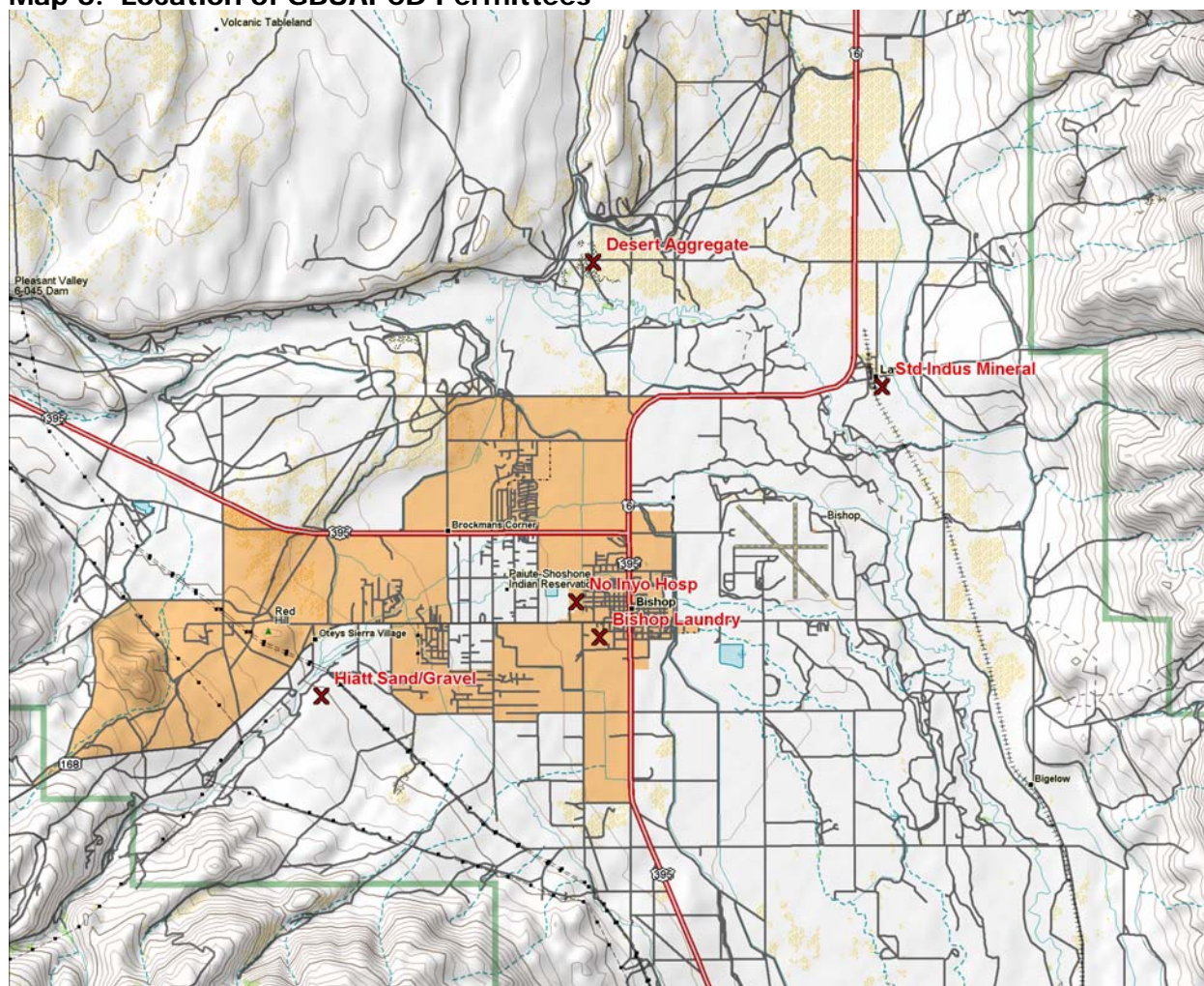
The sites that are closest to the Reservation (less than a mile) are Bishop Laundry / Linen and Northern Inyo Hospital. Both produce relatively small amounts of pollutants (less than 1 ton per year of PM-10). The next closest site is Hiatt Sand and Gravel, also a relatively small producer of pollutants (5.1 tons per year of PM-10). The two larger producers, Desert Aggregates and Standard Industrial Mineral are located between 3 and 5 miles northeast of the

Reservation and prevailing winds rarely come from that direction (Duane Ono, GBUAPCD, personal communication).

Table 7. Permit Information from the Great Basin Unified Air Pollution Control District.

Facility	Year	CO	NOX	SOX	PM	PM-10
Bishop Laundry / Linen	1999	0.3 tons/yr	3.6 tons/yr	8.2 tons/yr	0.1 tons/yr	0.6 tons/yr
Desert Aggregates	1999		6 tons/yr	9 tons/yr	94.8 tons/yr	26.5 tons/yr
Hiatt Sand and Gravel	1999				10.1 tons/yr	5.1 tons/yr
N. Inyo Hospital	1999		0.3 tons/yr		0.8 tons/yr	0.2 tons/yr
Standard Industrial Mineral	1999		1 ton/yr		17 tons/yr	7.4 tons/yr

Map 6. Location of GBUAPCD Permittees



d. Vehicle Emissions in Inyo County

On-road motor vehicle emissions are estimated by the California Air Resources Board and are contained in Table 3, described above. In Inyo County, on-road motor vehicles are the single most important source of total organic gasses, reactive organic gasses, carbon monoxide, and nitrogen oxides. More detailed calculations for the reservation's share of vehicle emissions is in Section 5 below.

e. Controlled Burning in the Great Basin Unified Air Pollution Control District

Information on controlled burns throughout the Great Basin Unified Air Pollution District was obtained from GBUAPCD. This information is listed in Table 8 below. Of the sources reported by the air pollution control district, the Bureau of Land Management, the City of Los Angeles and the Inyo National Forest comprise the largest landowners in Inyo County. Among these sources, the Inyo National Forest is by far the largest contributor in terms of acres and tons of PM-10, although the contribution per acre is assumed to be constant across all entities.

Table 8. Controlled Burns in the Great Basin Air Pollution District, 2001

Agency	Acres	PM-10 (tons)	PM-10 (tons/tons fuel)	Fuel (tons / acre)
Bureau of Land Management				
California Department of Forestry	171	12.0	0.007	10
City of Los Angeles Department of Water and Power				
Death Valley National Park	20	0.1	0.010	0.5
Eldorado National Forest				
Humboldt-Toiyabe National Forest				
Inyo National Forest	1,432	80.2	0.007	8
Stanislaus National Forest	17	1.2	0.007	10
TOTAL	1,640	93.4		

4. SOURCE INVENTORY OF ALL SOURCES WITHIN THE TRIBAL JURISDICTION AND PRIORITIZATION FOR FUTURE REGULATION

The following sources have been identified within the Bishop Paiute Reservation. They are listed from highest to lowest priority. The emissions from these sources have been estimated in Section 5. below.

- Emissions from residential trash burning (highest priority for regulation in concert with solid waste plan)
- Smoke from residential wood burning for home heating (next highest priority)
- Emissions from vegetative waste (low priority due to the small quantities involved)
- Fugitive dust from dirt roads (low priority due to small number of miles involved)
- Fugitive dust from paved roads (low priority due to small number of miles involved)
- Vehicle emissions (low priority due to small population size)

A summary of PM-10 data from on-reservation sources is given in Table 9 below. The largest source of PM-10 is from residential wood burning for home heating. Fugitive dust from dirt roads is next. Among the sources of air pollution on the reservation, residential trash burning has been identified as the highest priority source for reducing on-reservation emissions. Trash

burning is also a source of dioxins, a toxic air contaminant and has recently been regulated by the California Air Resources Board. The Bishop Tribe's Environmental Management Office proposes to develop a plan for reducing residential trash burning in conjunction with a solid waste management plan. Residential wood burning for home heating is the next highest priority source for reducing on-reservation emissions.

Table 9. PM-10 from On-Reservation Sources

SOURCE	PM-10 (Kg/year)	PM-10 (tons/year)
Residential Trash Burning	1,562	1.72
Smoke from Residential Wood Burning for Home Heating	14,306	15.77
Vegetative Waste	127	0.14
Fugitive Dust from Dirt Roads	4,745	5.23
Entrained Paved Road Dust	3,584	3.95
Other Vehicle PM-10	322	0.35

5. EMISSIONS INVENTORY

This emissions inventory has been calculated from a variety of sources. All calculations are in grams or kilograms. Summary measures of PM-10 in the executive summary and in section 4 are presented in both kilograms/year and tons/year.

a. Dioxin, other air toxics and PM-10 emissions from residential trash burning

Trash incineration on the reservation is important because it is a source of dioxins and other toxic air pollutants, as well as PM-10. Trash incineration is also a potential nuisance due to the unpleasant odors that may be emitted. The US Environmental Protection Agency and the California Air Resources Board have identified dioxins as an important air toxic due to its potential carcinogenicity and wide-ranging impacts on a variety of biological processes. The California Air Resources Board recently adopted a rule banning all backyard trash incineration, indicating the importance of this problem. However, this rule does not apply to the Bishop Reservation.

Residential trash incineration is a potentially important area for future air quality regulations on the Bishop Reservation and dovetails with the Bishop Tribe's Environmental Management Office's intention to develop a solid waste management plan.

DATA SOURCES

Wood Burning Survey

During the course of chimney sweeping activities undertaken by the Community Development Department, participants were asked to complete a questionnaire on their use of wood for home heating and on the use of back yard incinerators for trash disposal.

Out of approximately 100 households taking of the chimney sweeping service, 23 returned completed questionnaires. These questionnaires were used to provide preliminary estimates of trash burning, percent affected by burning and frequency. Of the 23 households responding, 6 (or 30 percent) reported back yard incineration, with an average frequency of 1.5 times per week. In addition, when respondents were asked to comment on the most important air quality

problem on the reservation, 6 (or 25 percent) responded and all 6 indicated the most important concern was residential trash burning.

General Tribal Survey

As part of developing a Comprehensive Economic Development Strategy for the Bishop Paiute Tribe and updating the Economic Development plan, a general survey was administered to 366 households. Households were asked about back yard trash incineration and whether they were affected by trash burning.

This survey is used to estimate the number and percentage of residents who burn trash and the number and percent that are affected by back yard trash burning.

23 percent of households report burning trash and 41 percent report that they are affected by trash burning. A number of residents specifically commented about offensive odors from trash burning and the need to restrict trash burning to daylight hours. We believe that this information combined with the information from the wood burning survey shows a high level of concern among reservation residents regarding residential trash burning.

CALCULATIONS

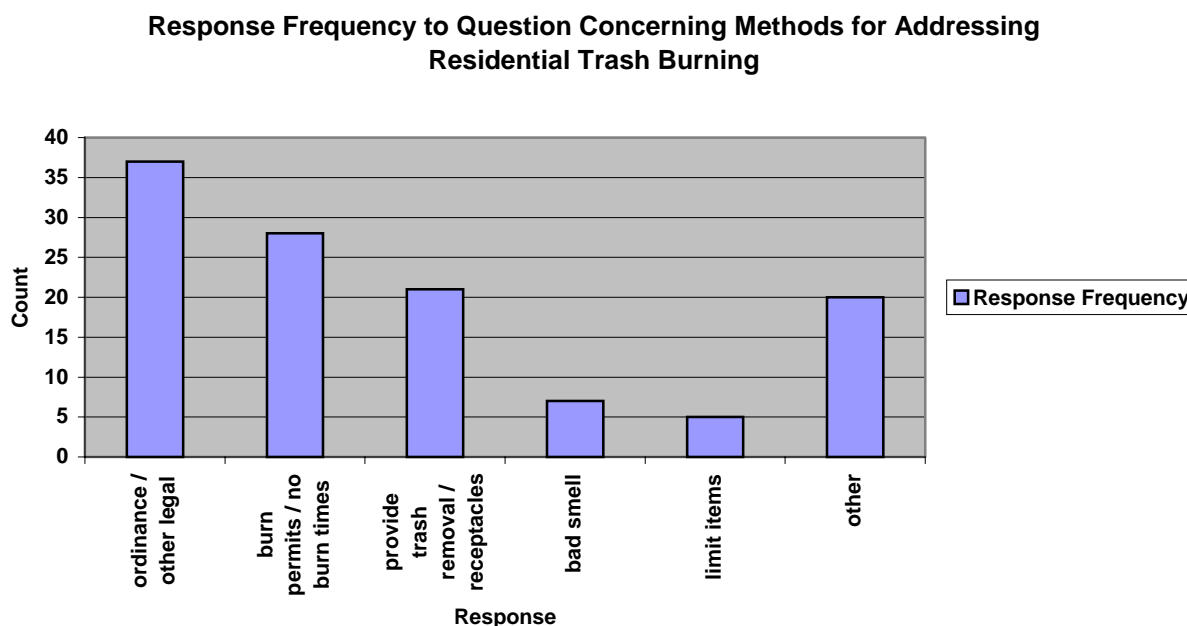
The Bishop Indian Utility Organization reports that there are approximately 570 residential water and sewer hook-ups on the Reservation. This is a maximum estimate.

TOTAL NUMBER OF HOUSEHOLDS BURNING TRASH
 $= 570 \times .23 = 131$

TOTAL NUMBER OF HOUSEHOLDS AFFECTED BY TRASH BURNING
 $= 570 \times .41 = 234$

Respondents were also asked about suggestions for addressing the problem. This was an open-ended question. Responses were coded based on written answers. Respondents could give multiple answers.

The most common response involved developing an ordinance or policy against trash burning, followed by requiring burn permits and / or specifying burn times. Of note, many respondents who mention restricting burn times emphasize that no burning should take place at night. The third most common response involved the Tribe providing either trash removal or trash receptacles. These results are shown in Figure 5 below. These results confirm that residential trash burning may be an appropriate area for air quality regulation in the future and that combining some regulation and education regarding the risks involved in trash burning with improved solid waste management may be a valuable policy tool for the Bishop Tribe.

Figure 5.

As noted above, recently, the California Air Resources Board has promulgated regulations that eliminate backyard trash burning (except for yard waste) and the use of burn barrels throughout the state (with some exemptions for colored paper). The primary concern is the production of dioxins during trash burning caused by relatively low combustion temperatures and the oxygen-starved environment typically present in burn barrels. The calculations that follow provide preliminary estimates of the emissions from trash burning on the Bishop Reservation, using the emissions factors in the California Air Resources Board "Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure to Reduce Emissions of Toxic Air Contaminants from Outdoor Residential Waste Burning."

WASTE GENERATED PER DAY PER HOUSEHOLD (from CARB, 2002, Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure to Reduce Emissions of Toxic Air Contaminants from Outdoor Residential Waste Burning)

= 5.9 pounds / day / household or
= 970 kg / household / year

TOTAL WASTE BURNED ON THE BISHOP RESERVATION PER YEAR

= 131 households burning trash x 970 kg / household / year
= 127,070 kg/year

EMISSIONS FACTORS (from CARB, 2002, Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure to Reduce Emissions of Toxic Air Contaminants from Outdoor Residential Waste Burning)

Pollutant	Average Emissions Factor (mg/kg burned)
Dioxins (EPA Series 1, 1997 Testing)	0.16
Dioxins (EPA Series 2, 2000 Testing)	0.005
1,3-Butadiene	141.2
Benzene	979.7
PAHs	45.0
PCBs	0.13
PM-10	12,300

EMISSIONS FOR THE BISHOP RESERVATION PER YEAR

= 127,070 kg / year x emissions factor (mg / kg burned)

Table 10. Emissions from Residential Trash Burning

Pollutant	Total Emissions (g)
Dioxins (EPA Series 1, 1997 Testing)	20.33
Dioxins (EPA Series 2, 2000 Testing)	0.64
1,3-Butadiene	17,942.28
Benzene	124,515.89
PAHs	5,718.15
PCBs	16.52
PM-10	1,562,961.00 (1,562.96 kg)

Emissions estimates yield between 0.64 and 20.33 g of dioxin emitted from the Bishop Reservation during the course of a year. For comparison, the estimated number of kilograms of PM-10 generated from trash burning is 1,563 kg, as compared to 14,306 kg / year generated from residential wood burning for home heating (discussed below). From the point of view of PM-10, residential wood burning has about 10 times the impact of trash burning.

b. PM-10 emissions from residential wood burning for home heating**DATA SOURCES****Wood Burning Survey**

During the course of chimney sweeping activities undertaken by the Community Development Department, participants were asked to complete a questionnaire on their use of wood for home heating and on the use of back yard incinerators for trash disposal.

Out of approximately 100 households taking advantage of the chimney sweeping service, 23 returned completed questionnaires. These questionnaires were used to estimate the number of cords and the type of wood burned.

On average 3.14 cords were burned by the household, with the majority reporting that they burned either various types pine (primarily Jeffrey and Pinon). Therefore soft woods are used to estimate emissions from stoves.

General Tribal Survey

As part of developing a Comprehensive Economic Development Strategy for the Bishop Paiute Tribe and updating the Economic Development plan, a general survey was administered to 366 households. Households were asked about their use of wood stoves for home heating.

This survey is used to estimate the number and type of wood stoves on the reservation.

78 percent of households report heating their homes with wood. Of these, 32 percent report that their stove is an EPA-certified wood stove.

CALCULATIONS

The Bishop Indian Utility Organization reports that there are approximately 570 residential water and sewer hook-ups on the Reservation. This is a maximum estimate.

TOTAL NUMBER OF HOUSEHOLDS HEATING WITH WOOD

$$= 570 \times .78 = 445$$

TOTAL NUMBER OF HOUSEHOLDS HEATING WITH A STANDARD WOOD STOVE

$$= 445 \times .68 = 303$$

TOTAL NUMBER OF HOUSEHOLDS HEATING WITH AN EPA-CERTIFIED WOOD STOVE

$$= 445 \times .32 = 142$$

CONSTANTS (from Town of Mammoth Lakes, Air Quality Management Plan, 1990)

Mass = (#cords x 800 kg/cord)

Emissions factor

$$= 8.1 \text{ g/kg wood stoves with catalytic converter}$$

$$= 15.0 \text{ g/kg conventional wood stoves}$$

ANNUAL PM-10 EMISSION ESTIMATES

PM-10 emissions / device = Mass x e.f.

ANNUAL PM-10 EMISSIONS FOR A STANDARD WOOD STOVE

PM-10 emissions / std wood stove

$$= 3.14 \text{ cords} \times 800 \text{ kg/cord} \times 15.0 \text{ g/kg}$$

$$= 37,680 \text{ g}$$

$$= 37.68 \text{ kg/stove}$$

ANNUAL PM-10 EMISSIONS FOR ALL STANDARD WOOD STOVES

$$= 37.68 \times 303 = 11,417 \text{ kg/year}$$

ANNUAL PM-10 EMISSIONS FOR AN EPA-CERTIFIED WOOD STOVE

PM-10 emissions / catalytic wood stove

$$= 3.14 \times 800 \text{ kg/cord} \times 8.1 \text{ g/kg}$$

$$= 20,347 \text{ g}$$

$$= 20.35 \text{ kg/stove}$$

ANNUAL PM-10 EMISSIONS FROM ALL EPA-CERTIFIED WOOD STOVES

$$= 20.35 \times 142 = 2,889 \text{ kg/year}$$

TOTAL ANNUAL PM-10 EMISSIONS FROM ALL STOVES

$$= 11,417 + 2,889 = 14,306 \text{ kg/year}$$

c. Emissions from vegetative waste

The Reservation is comprised of 875 acres, the majority of which are agricultural or residential. The water table is close to the surface, due to a perched aquifer and two creeks and numerous ditches run through the reservation. Although the area generally receives low rainfall, dense vegetation of willows and other riparian plants can be found along waterways and in marshy areas. Some residents burn vegetation to control its amount and spread. It is estimated that at most 5 acres per year are treated with fire to control vegetation. Estimates assume 4 tons of fuel per acre (intermediate between the Inyo National Forest and pile burns) with an emission factor of 0.007 tons PM-10 per ton of fuel (GBUAPCD, 2001 Burns).

CALCULATIONS

PM-10 in kilograms per year

$$\begin{aligned}
 &= 5 \text{ acres} \times 4 \text{ tons fuel/acre} \times 0.007 \text{ tons PM-10/ton of fuel} \times 2000 \text{ pounds/ton} \\
 &\quad \times 0.4536 \text{ kg/pound} \\
 &= 127 \text{ kg/year}
 \end{aligned}$$

d. PM-10 emissions from dirt roads

According to the 1996 Transportation Plan, prepared for the Bishop Paiute Reservation by ASCG Inc., there is 1 mile of unpaved road on the Bishop Paiute Reservation (0.1 miles gravel and 0.9 miles earth). It is comprised of 5 segments, ranging in length from 0.1 miles to 0.5 miles in length. If there one residence in each 0.1-mile stretch, approximately 10 residences would be served by this dirt road.

VEHICLE MILES TRAVELED

If each resident makes 2 round trips on each mile of road, they would generate

$$10 \text{ residents} \times 2 \text{ trips / day per resident} \times 2 \text{ miles / trip} = 40 \text{ vehicle miles per day.}$$

Calculations below assume 50 vehicle miles per day on the reservation dirt roads.

Using factors from the 1998, GBUAPCD "Owens Valley PM-10 Planning Area Demonstration of Attainment State Implementation Plan," emissions can be calculated as follows:

$$\begin{aligned}
 \text{PM-10} &= 2.1 (s/12) (S/30) (W/3)^{0.7} (w/4)^{0.5} [(356-p)/365] \text{ pounds/vehicle-mile traveled} \\
 &= 0.58 \text{ pounds} \times 0.4536 \text{ kg/pound} \\
 &= 0.26 \text{ kg / vehicle-mile traveled}
 \end{aligned}$$

Where

PM-10	=	PM-10 emissions in pounds per vehicle mile traveled
s	=	silt content of road surface material (5 percent)
S	=	mean vehicle speed (20 miles per hour)
W	=	mean vehicle weight (3 tons)
w	=	mean number of wheels (4 wheels)
p	=	number of days per year with precipitation greater than 0.01 inches (assumed to be zero for worst-case emissions)

TOTAL PM-10 EMISSIONS FROM DIRT ROADS PER YEAR

$$\begin{aligned}
 &= 50 \text{ vehicle-miles traveled} \times 0.26 \text{ kg/mile traveled} \times 365 \text{ days/year} \\
 &= 4,745 \text{ kg/year}
 \end{aligned}$$

For comparison, PM-10 emissions from wood stoves are estimated to be 14,306 kg/year and those from residential trash burning are 1,563 kg/year.

e. Vehicle emissions from paved roads

A 1999 report from the Inyo County Road Department provides estimates of the number and speeds of vehicles traveling on many of the major roads on the reservation. The length of each road segment on the Reservation is available in the 1996 Transportation Plan, prepared for the Bishop Paiute Reservation by ASCG Inc. There are a total of 9.05 miles of paved roads on the Bishop Reservation and 2.70 miles of US Highway. (Highway 168 bisects a portion of the Reservation and Highway 395 defines the northern boundary of the Reservation.)

Entrained Paved Road Dust

The figures for the number of vehicles from the Inyo County Road Department cover 5.4 miles of main Reservation Roads that serve as through fares. The PM-10 emissions are calculated based on the assumption that each vehicle traverses the full length of each road segment. For these roads, the emissions rate of 0.83 pounds PM-10 per 1,000 vehicle miles for major and collector roads is used. For the remaining roads, which are primarily local roads that do not serve as connectors, the emission rate of 3.4 pounds PM-10 per 1,000 vehicle miles traveled is used, except for Barlow Lane which is assumed to have the same traffic as nearby Brockman Lane with corresponding emission rates for main and collector roads and See Vee Lane which is assumed to be an average of Tu Su and Pa Ha lanes.

The figures for the number of vehicles from the California Department of Transportation cover the 2.70 miles of Highways 395 and 168. Highway 395 forms the northern boundary of the reservation and highway 169 bisects the reservation. Most of the traffic comes from off the reservation. The PM-10 emissions are calculated on the assumption that each vehicle traverses the full length of each highway segment. An emissions rate of 0.57 pounds PM-10 per 1,000 vehicle miles traveled is used. Due to their relatively heavy traffic, these two roads contribute very significantly to the entrained dust, accounting for 70 percent of the dust from paved roads on the reservation.

Table 11. PM-10 Emissions due to Entrained Dust from Paved Roads

Road	Length	Number of Vehicles per Day	Source of Vehicle Count	Vehicle Miles Traveled (VMT)	Emissions factor (pounds per 1,000 VMT)	PM-10 (kg)	PM-10 per year (kg)
Pa Ha	2.00	720	Inyo Rd Dept	1,440	0.83	0.54	198
Barlow	1.45	2551	Inyo Rd Dept	3,699	0.83	1.40	508
Tu Su	0.95	901	Inyo Rd Dept	856	0.83	0.32	118
Diaz	1.00	393	Inyo Rd Dept (avg of 2 segments)	393	0.83	0.15	54
Tibec	0.10	100	assumed	10	3.40	0.02	6
Taboose	0.25	100	assumed	25	3.40	0.04	14
Sew Huvah	0.10	100	assumed	10	3.40	0.02	6
Winuba	0.75	100	assumed	75	3.40	0.12	42
Sewaye	0.10	100	assumed	10	3.40	0.02	6
Brockman	0.95	2,551	Same as Barlow	2,423	0.83	0.91	333
See Vee	0.95	810	Avg. of Tu Su and Pa Ha	770	0.83	0.29	106
Pa Me	0.45	100	assumed	45	3.40	0.07	25
Subtotal (on-reservation roads only)	9.05	8,526		9,756		3.90	1,416
Hwy 395	0.70	10,250	CalTrans (avg. of 2 points)	7,175	0.57	1.86	677
Hwy 168	2.00	7,900	CalTrans (avg. of 2 points)	15,800	0.57	4.09	1,491
TOTAL (including highways)	11.75	26,676		32,731		9.84	3,584

Total On-Road Motor Vehicle Emissions

Each year, the California Air Resources Board (CARB) publishes data on estimated on-road motor vehicle emissions by county. These figures are given in tons per day in Table 3 above and are used to apportion the CARB mobile source inventory based on the vehicle miles traveled on the reservation. Values have been converted in to kilograms/year for consistency with other calculations in the emissions inventory for the reservation.

CALCULATIONS

SHARE OF INYO COUNTY VEHICLE MILES TRAVELED ON THE BISHOP RESERVATION

$$= \text{Reservation Vehicle Miles Traveled} / \text{Inyo County Vehicle Miles Traveled}$$

On-Reservation Roads only

$$= 9,756 / 1,348,793$$

$$= 0.0072$$

Including Highways

$$= 32,731 / 1,348,793$$

$$= 0.0243$$

CONVERSION FACTOR FOR TONS / DAY TO KILOGRAMS / YEAR

$$\text{Tons/day} \times 365 \text{ days/year} \times 2,000 \text{ pounds/ton} \times 0.4536 \text{ kg/pound}$$

$$= 331,128$$

Table 12. Share of Motor Vehicle Emissions for the Bishop Paiute Reservation

Region / Roads	TOG	ROG	CO	NOX	SOX	PM	PM-10
Inyo County (kg / year)	668,879	622,521	5,470,235	649,011	3,311	13,245	13,245
Bishop Reservation							
Reservation Roads Only (kg / year)	4,816	4,482	39,386	4,673	24	95	95
Including Highways (kg / year)	16,254	15,127	132,927	15,771	80	322	322

REFERENCES

California Environmental Protection Agency, Air Resources Board, 2001, The 2001 Almanac of Emissions and Air Quality.

Great Basin Unified Air Pollution Control District, 1990, Air Quality Management Plan for the Town of Mammoth Lakes.

Great Basin Unified Air Pollution Control District, 1998, Owens Valley PM₁₀ Planning Area Demonstration of Attainment State Implementation Plan.

Inyo National Forest, 2001, Environmental Assessment of Proposed Changes in the Pine Creek Tungsten Mine Reclamation Plan.

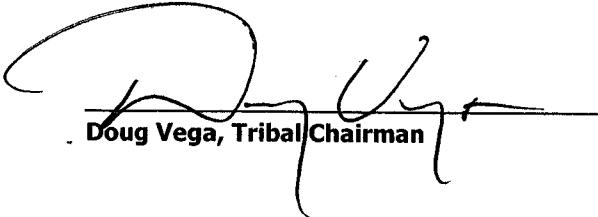
WEBSITES

California Air Resources Board
www.arb.ca.gov

The Weather Channel
www.weather.com


US Environmental Protection Agency
www.oaspub.epa.gov/airsdata

**This report has been reviewed and authorized for distribution by the Environmental Management
Office of the Bishop Paiute Tribe**



Doug Vega, Tribal Chairman

Date 8/28/02



Alan Spoonhunter, Environmental Manager

Date 8/28/02